THE GENUS DUABANGA

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THE GENUS *Duabanga* was first suggested by Buchanan-Hamilton as a new genus with characters connecting the Lagerstroemias and the Sonneratias. Probably the name is derived from "Duyabangga" a vernacular name for the tree in Tripura. Roxburgh (1832) had collected and described as *Lagerstroemia grandiflora* a plant which was the same as that collected by Hamilton and sent to Sir Joseph Banks in 1798 and described by him as *Duabanga sonneratioides* in 1835. Roxburgh's *L. grandiflora* was later transferred to the genus *Duabanga* by Walpers. *Duabanga* and *Sonneratia* compose the family Sonneratiaceae.

The two genera have been placed under various other families by different authors. Lindley (1836) placed *Sonneratia* in the tribe Myrteae (Myrtaceae) and *Duabanga* in Lagerstroemieae (Lythraceae) while Miquel (1855) placed *Sonneratia* in the tribe Sonneratieae (Myrtaceae) and *Duabanga* in Lythreae (Lythraceae). Bentham and Hooker (1867) included both genera in the Lythreae (Lythraceae) and this was adopted by Koorders and Valeton (1894), while Koehne excluded both genera from his monograph on the Lythraceae. Niedenzu (1892) placed *Duabanga* in the family Blattiaceae along with *Sonneratia* as a synonym to *Blatti*. Engler (1897) formed the family Sonneratiaceae to include the two genera.

The family is distinguished from the Lythraceae by flower, pollen, and anatomical characteristics. In Sonneratiaceae the ovary is partially fused to the receptacle, forming a distinctive half-inferior fruit. The smooth pollen has two or three regularly placed germ pores, and fiber bundles are distributed in the pith.

The small genus *Duabanga* consists of three species, *D. moluccana* Bl., *D. grandiflora* (Roxb. ex DC.) Walp. and *D. taylorii* sp. nov., all large trees growing in the rain forest extending from the southeastern Himalaya to New Guinea and on the islands in between. A new species, *Duabanga taylorii*, described here, is named for Sir George Taylor, Director of the Royal Botanic Gardens, Kew. The seed of this species was received, probably from Java, in 1853, and four trees planted in the Royal Botanic Gardens, Peradeniya, have now reached an average height of over 128 feet, 26 feet in girth at breast height, and a spread of 79 feet (FIG. 6).

KEY TO THE SPECIES

Stamens uniseriate.

Stamens 12; trunk columnar; flowers 4-merous; ovary dome-shaped; fruit 1–3.7 cm. long. ..... *D. moluccana.*

Stamens 24–45; trunk branched 1.8–6 m. from ground; flowers 4- or 5-merous; ovary ovate; fruit 1.5–2.5 cm. long. ..... *D. taylorii.*
Stamens biseriate; trunk straight and columnar; flowers 6-merous; stamens indefinite; ovary conical; fruit 3–4.2 cm. long. ..... *D. grandiflora.*

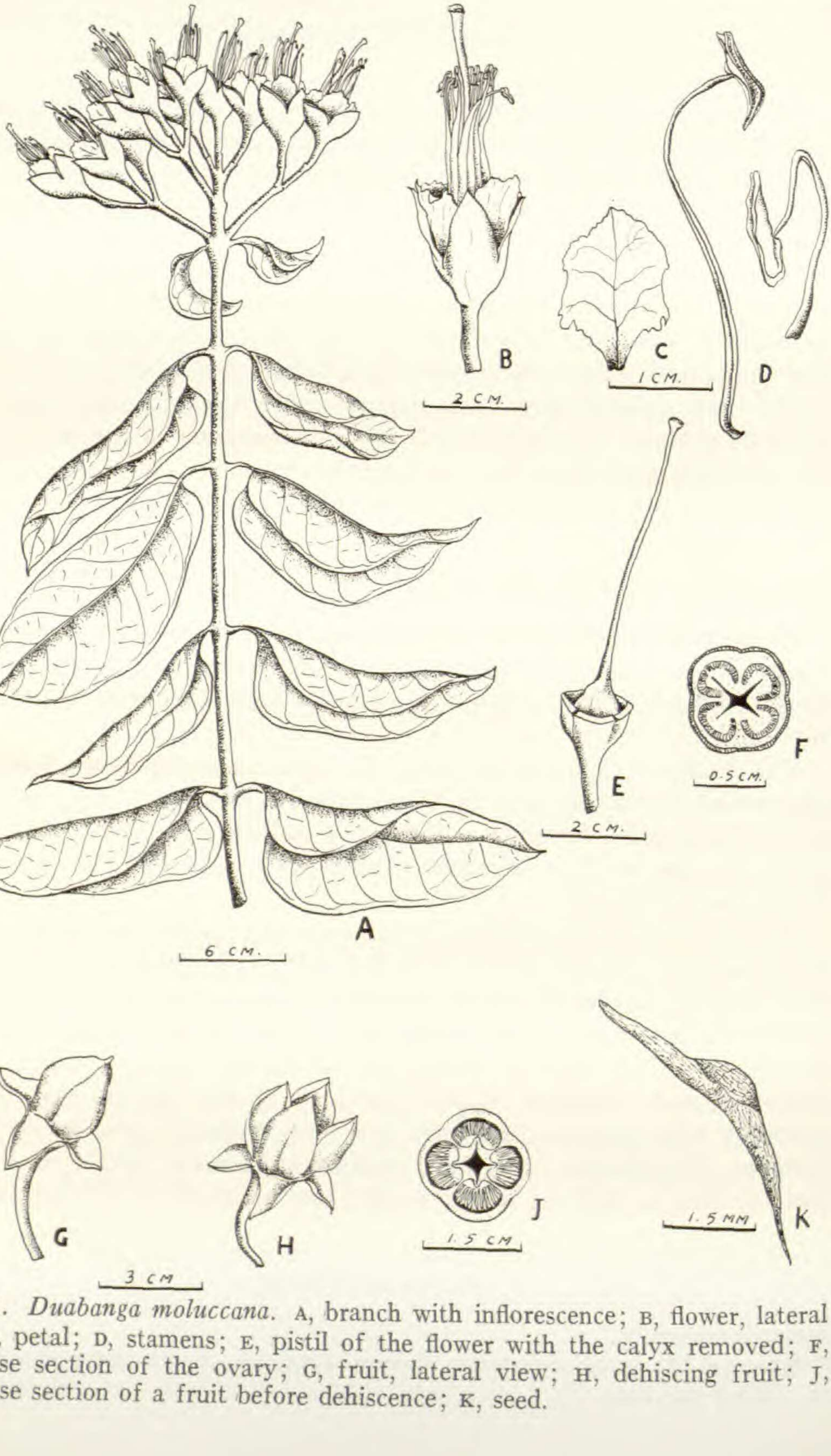


FIG. 1. *Duabanga moluccana.* A, branch with inflorescence; B, flower, lateral view; C, petal; D, stamens; E, pistil of the flower with the calyx removed; F, transverse section of the ovary; G, fruit, lateral view; H, dehiscing fruit; J, transverse section of a fruit before dehiscence; K, seed.

Duabanga moluccana Blume, Mus. Bot. Lugd.-Bat. 1: 109. 1849. (FIG. 1)

Duabanga borneensis R. Knuth, Repert. Sp. Nov. 38: 121. 1935.

Large or medium-sized trees, 8–42.4 m. tall, trunk more or less columnar, branching at 23 m. from ground, unbuttressed or faintly buttressed, young branchlets quadrangular, winged, becoming terete when mature, with 9–15 pairs of leaves; young leaves and stems covered with short adpressed hair but becoming glabrescent, internodes 2–9.5 cm. long, with 2 pairs of projections corresponding to bases of wings at base, branches brittle; leaves simple, opposite, oblong, oval, ovate, lanceolate or ovate-oblong, 4–32.6 cm. long, 2.1–12.5 cm. broad, more or less cordate with rounded lobes or rounded at base, acuminate, acute, coriaceous, glabrous, entire, costa prominent below with 5–28 pairs of widely patent, arcuate, lateral veins merging into an intramarginal vein, petiole 0.3–1.2 cm. long; flowers regular, bisexual, perigynous in simple or compound, dichasial, terminal, minutely pubescent corymbs, buds ovoid-oval, pubescent, 0.4–2 cm. long, 0.3–1.5 cm. broad, bracts lanceolate or spathulate, caducous, 0.65–1.1 cm. long, hairy, pedicels 0.2–2 cm. long, strongly quadrangular, ridges extending to fused margins of sepals; calyx funnel-shaped, 1–2.3 cm. in diameter, segments 4, oblong-ovate, 0.5–1.6 cm. long, 0.4–1 cm. broad, short acuminate, acute, thick, fleshy, green, persistent in the fruit; petals 4, greenish cream-white, with center pink, 1.6–1.8 cm. long, 0.8–1.1 cm. broad, short clawed, valvate, overlapping in bud, caducous; stamens 12, uniseriate on a narrow circular rim round the ovary, filaments greenish white, broad and flat at the base, filiform, recurved, caducous, about 3 cm. long, anthers brownish white; ovary half-inferior, dome-shaped, broader than tall, 0.5 cm. long, 4-locular, with numerous ovules on cushion-shaped placentae, style 2.5–4 cm. long, greenish yellow, stigma faintly 4-lobed, dark green with a brown center; fruit oblong-ovoid, loculicidally dehiscent, capsule 4-valved, 1–3.7 cm. long, 0.8–2 cm. broad, slightly narrowed at base on a stout quadrangular pedicel with persistent calyx segments; seeds numerous, testa drawn out on either side, 5 mm. long from end to end.

ILLUSTRATIONS. VIDAL, Synopsis de Familias. Atlas *pl. 52, fig. F, 1–5.* 1883; KOORDERS & VALETON, Atlas der Baumarten von Java 4: *fig. 784.* 1918; JAYAWEERA & HOWARD, Baileya 10: *fig. 5.* 1962.

DISTRIBUTION. The tree flourishes along streams and slopes in primary forests of Java, Borneo, Celebes, Moluccas, New Guinea, Talaud, Lesser Sunda and Philippine Islands at altitudes between 10 m. and 1250 m., attaining a height of 8–42.4 m. and a girth of 1.12–2.3 m.

Borneo. SARAWAK: *Haviland & Hose 3622 M*; Gaat, Upper Rajan River, *Clemens 21548.* BRITISH NORTH BORNEO: Paitan, *Maidin 2669*; Pinta-san, *Clemens 34202*; Sandakan, *Elmer 20262*; *Sapilok & Kabili s.n.*; without locality, *Wood s.n.; Kadir A531, A561.* NETHERLANDS BORNEO: Berau, *NIFS b.b. 18890, b.b. 19237, b.b. 18872, b.b. 18811*; Sangkulirang, *Aet* (exp. E. Walsh) *695*; Sambodja, *de Voogd 1610*; Klumpeng, *NIFS b.b. 17272.* **Celebes.** Poso, Kalaena,

FIG. 2. *Duabanga taylorii*, a drooping branchlet and a mature leaf in outline.

NIFS b.b. 28740; Malini, *NIFS Cel/III-90*; Manado, *NIFS b.b. 28231*. **Halmahera.** MOLUCCAN TERNATE: Batjan Is., *NIFS b.b. 16441*; *Weda Is., NIFS b.b. 24926*. **Philippine Islands.** LUZON: Bulacan Prov., *Ramos 21746*; Angat, *Llanos 233*; Rizal Prov., *Vidal 2883*; Bosoboso, *Ramos 4577*; *Ahern's collector 3246*; *Ramos 1341*; Sorsogon Prov., Irosin (Mt. Bulusan), *Elmer 15326*; Tabayas Prov., Guinayangan, *Hagger 254*; Laguna Prov., Los Banos (Mt. Maquiling), *Elmer 18275*; Mount Prov., Tanit, *Lizardo 29386;* Albay Prov., *Vidal 261*; without locality, *Ahern US 446105*; *Garcia 1110*; *Loher 2149*; *Whitford 814*; *Merritt 11409*; *Ahern 158, 106*; *Ahern's collector 2003*. NEGROS: Santa Cruz, *William's collector 2885*. MINDANAO: Davao Prov., *de Mesa 27477*; Pagpawan Sitio, *Edano 11601*; Cotabato, *Ferraris 23045*; without locality, *Ahern, US 445972, Miranda 20521, Quadras 336*. **New Guinea.** NETHERLANDS NEW GUINEA: Idenburgh River, Bernhard Camp, *Brass & Versteegh 13514, 14015*; Palmer River, *Brass 7289*; Madang Dist., *Hoogland 5224*. BRITISH NEW GUINEA: Papua, Djamu, *Schlechter 17582*.

The leaves of collections from Borneo, *Elmer 20262, NIFS b.b. 18811, 18872*, and *19237*, are rounded at base, while those from Celebes, *NIFS Cel/III–90, b.b. 28740* and *Ramos 4577* from Luzon are faintly cordate, and those from elsewhere are quite cordate at the base. The fruits of *Brass & Versteegh 14015* from New Guinea are fusiform and, along with those from Sarawak, *Clemens 7287*, are much larger than those from collections elsewhere.

The tree growing at the Royal Botanic Gardens, Peradeniya, Ceylon, is 42.4 m. tall, 2.3 m. girth at breast height, with a columnar trunk branching at 23 m. from ground level. It flowers throughout the year.

This species is distinguished from the others by its columnar trunk and smaller, 4-merous flowers with 12, uniseriate stamens.

Duabanga taylorii sp. nov. (FIGS. 2, 3)

Arbor ingens, late patens, ramunculis pendentibus; folia magna, opposita, oblonga, integra, glabra, apice acuminata, basi cordata cum lobis inaequaliter orbiculatis, 5–25 paribus arcuatarum costarum infra conspicuarum cum vena intramarginali. Flores flavidi-albi, 5 cm. diam., in cymis simplice vel dichotomice terminalibus compositi; sepali 4 aut 5 aut plus, triangularia, valvati, carnosi, in gemma uniti; petali 4 aut 5 aut plus, liberi, flavidi-albi, ungulati, caduci; stamina 24–45, 1-seriata, filamentis longis, antheris introrsus versatilibus; ovarium semi-inferum, carpellis 4 aut 5 aut plus, compositum, 4- aut 5- aut plus locularibus, placenta axillari; capsula loculicidalis cum sepalis persistentibus; semina plurima, minima, filiformia, testa obvia.

Large trees, 33–44.5 m. tall with a spread of 22.6–25.6 m., trunk 7.3–8.8 m. in circumference branching at 1.8–6 m. from ground level, buttressed, young branchlets 1.2–5.2 m. long, quadrangular, soon becoming terete when mature, drooping, brown and lenticelled, internodes 5–12.5 cm. long, 13–44 pairs to a branchlet; leaves opposite, oblong, 2.7–43.5 cm. long, 1.4–17.2 cm. broad, cordate at base, lobes unequal, rounded, abruptly acuminate,

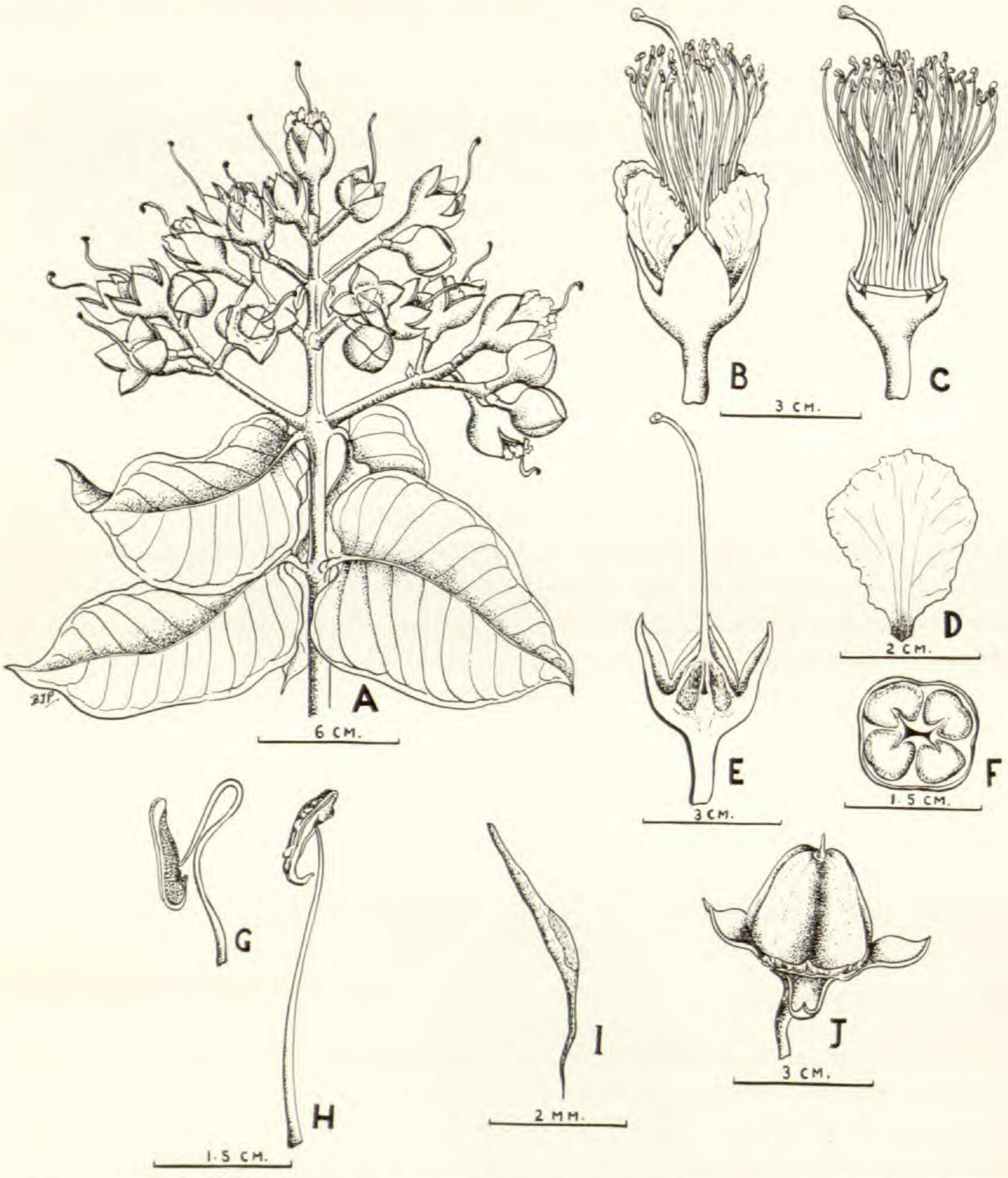


FIG. 3. *Diabanga taylorii.* A, branch with inflorescence; B, flower, lateral view; C, flower with the sepals and petals removed to show the stamens; D, petal, spread out; E, longitudinal section of the half-inferior ovary, petals and stamens removed; F, transverse section of an ovary; G, stamen at an early stage showing the recurved filament; H, stamen showing the hardened resinous globules at the back of the anther; I, seed; J, fruit with persistent calyx and base of style.

acute, entire, glabrous, veins 5–25 pairs, arcuate, prominent on the under surface with an intramarginal vein, petiole 0.5–0.6 cm. long, young leaves reddish brown in color; flowers regular, bisexual, perigynous, 5 cm. diameter, yellowish white, in simple or dichasial terminal cymes, buds ovate, 2.2 cm. long and as broad, puberulent, later becoming glabrous, pedicel 1.1 cm. long, articulate, quadrangular or terete; sepals 4 or 5,

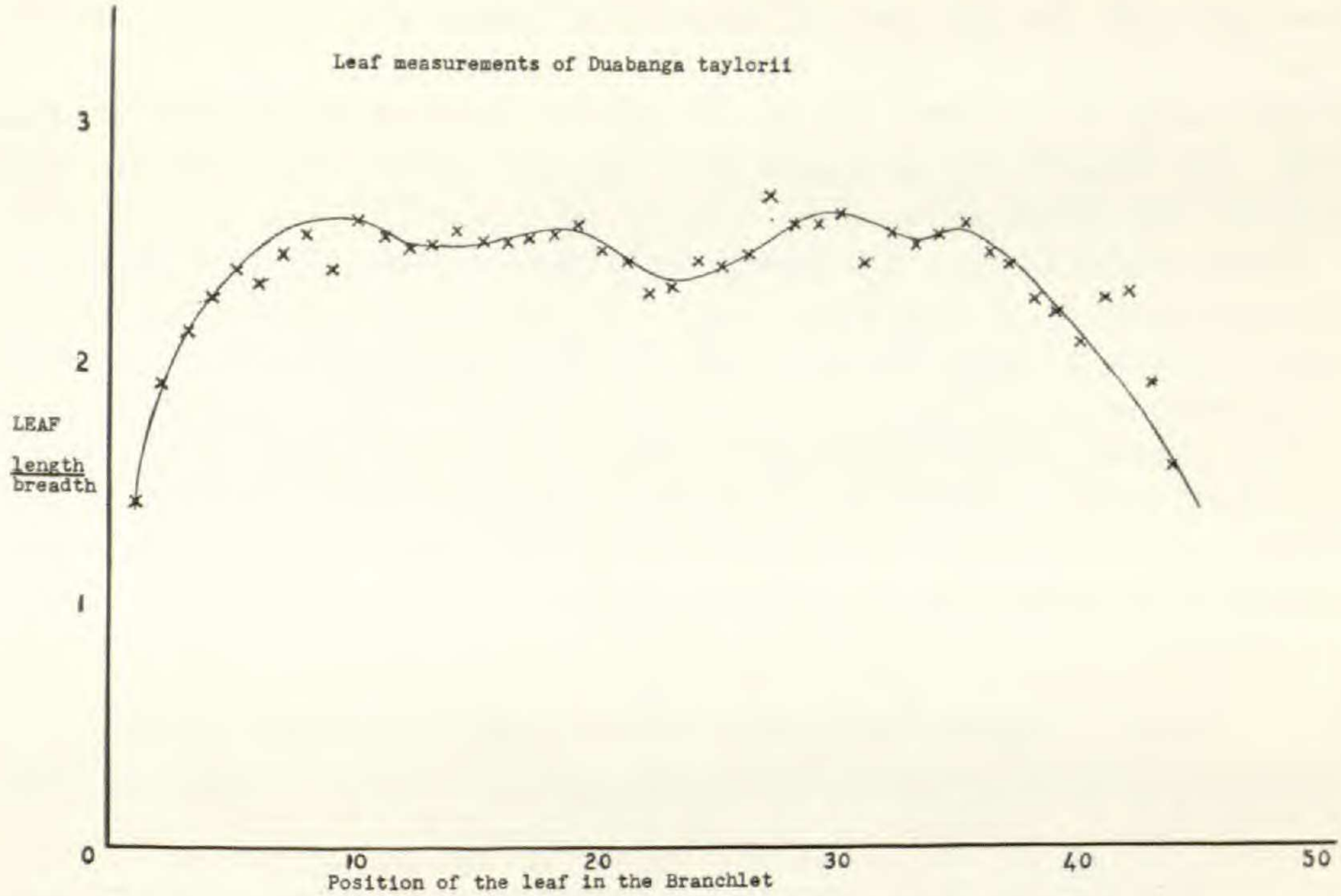


FIG. 4. *Duabanga taylorii*, showing the variation of leaf size in relation to position of leaves on the branchlets.

rarely 6 or more, valvate, triangular, fleshy, green, 1.8–2 cm. long, 1.2–1.8 cm. broad, fused in the bud; petals 4 or 5, rarely 6 or more, free, valvate, 2.5–2.7 cm. long, 2–2.1 cm. broad, obovate, short clawed, yellowish white, crinkled and plicate at the margin; stamens 24–45, uniseriate on a narrow circular rim round the ovary, filaments 4–4.7 cm. long, broad and flat at the base, recurved in bud, anther 1 cm. long, splitting longitudinally, versatile, introrse, glandular at the back, exuding a secretion which on drying hardens to resinous globules with pollen grains embedded within; ovary half-inferior, ovate, half-buried in the receptacle, upper portion dome shaped, 4–7-locular with axile placentation, style 5 cm. long, yellowish green, stigma capitate and dark green; fruit a broadly ovate, loculicidally dehiscent capsule, 1.5–2.5 cm. long, 1.7–2.5 cm. broad with persistent calyx segments; seeds numerous, very small, filiform, testa attenuate, 5.5 mm. long from end to end.

DISTRIBUTION. This is probably a native of Java; seed was introduced into the Royal Botanic Gardens, Peradeniya, Ceylon, in about 1853. It flourishes along river banks in the moist mid-country at an elevation of 457 m. above sea level.

Ceylon. PERADENIYA: Royal Botanic Gardens, *Jayaweera 2498*, July 8, 1964, holotype (PDA) and 4 isotypes; *Jayaweera 2496, 2497*.

There are four large trees of this species about 112 years old, growing at the Royal Botanic Gardens, Peradeniya, most probably the original introduction. The drooping branchlets bear 13–44 pairs of leaves. The

first pair and the last pair of leaves just before the production of the inflorescence are very small, while the intermediate ones are larger, the largest being in positions 16–18, 27 and 28, and 32–39 all over 30 cm. long. The largest leaf measured was the 34th which was 34.8 cm. long and 13.7 cm. broad (FIG. 4).

Floral counts of over 500 flowers were made (TABLE 1), and they were predominantly 4- or 5-merous. Some 17.6 per cent of the flowers had 30 stamens each, 13.4–15 per cent had 27–29 stamens and 13 per cent had 31 stamens each.

This species, *Duabanga taylorii*, differs from the others in the lower branching habit of the main trunk, the number of calyx and corolla segments, and the number of stamens which are uniseriate. It is, however, related to *D. moluccana* by its 4-merous flowers but differs in the number of stamens.

TABLE 1. **Variation in Numbers of Floral Parts in Duabanga taylorii.**

STAMEN NUMBER	24	25	26	27	28	29	30	31	32	33	34	35	36	45	
NUMBER OF SEPALS, PETALS, AND CARPELS															TOTAL FLOWERS
4, 4, 4	1	15	30	57	48	41	21	12	1	1	—	—	—	—	227
4, 4, 5	—	1	3	3	10	7	19	12	4	2	—	—	—	—	60
4, 4, 6	—	1	—	4	7	8	12	7	7	3	3	1	—	—	53
4, 4, 7	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
5, 4, 5	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
5, 5, 4	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
5, 5, 5	—	—	1	3	8	15	30	31	19	12	4	2	—	—	125
5, 5, 6	—	—	—	—	—	1	2	1	1	—	—	—	—	—	5
6, 5, 5	—	—	—	—	—	—	1	1	—	1	—	—	—	—	3
6, 6, 4	—	—	—	—	—	—	—	—	—	2	—	—	—	—	2
6, 6, 5	—	—	—	—	—	1	1	1	—	3	—	2	—	—	8
6, 6, 6	—	—	—	—	—	1	1	—	2	2	4	—	—	—	10
7, 6, 4	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
7, 7, 6	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
8, 8, 6	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
TOTAL INDIVIDUALS	1	17	34	67	73	75	88	65	34	26	12	6	1	1	500

Duabanga grandiflora (Roxb. ex DC.) Walp. Repert. 2: 114. 1843. (FIG. 5)

Lagerstroemia grandiflora Roxb. (Hort. Bengal. 39. 1814) ex DC. Mem. Soc. Hist. Nat. Genève **32:** 84. 1826.
Duabanga sonneratioides Buch.-Ham. Trans. Linn. Soc. **17:** 177–178. 1835.
Leptospartion grandiflorum Griff. Ic. Pl. As. **4:** 591. 1854.

Medium or tall tree, 6–40 m. tall, all parts glabrous, trunk straight, erect, with a smooth ash-colored, wrinkled and fissured bark; branches spiral or whorled on the trunk, drooping; branchlets quadrangular be-

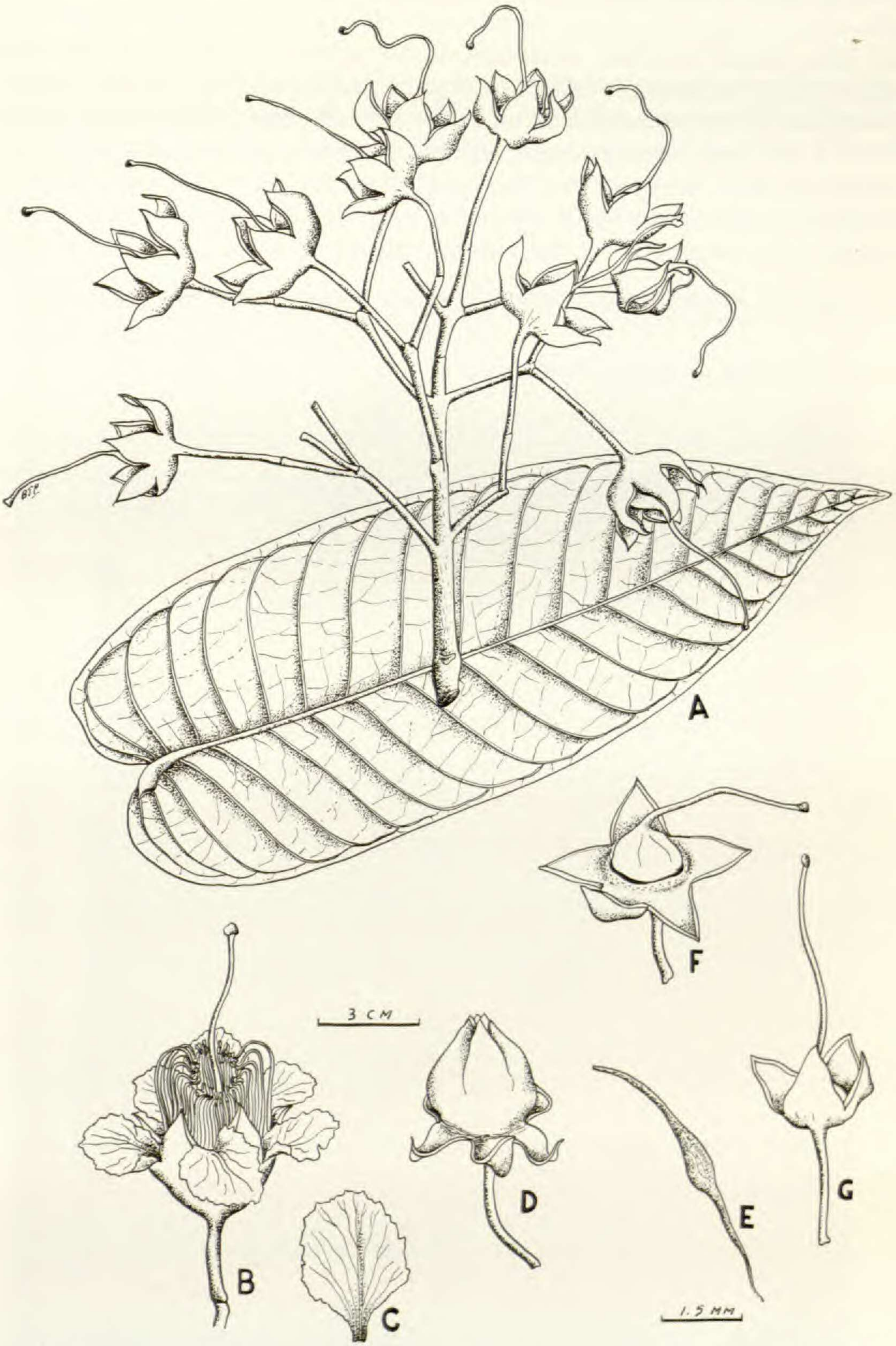
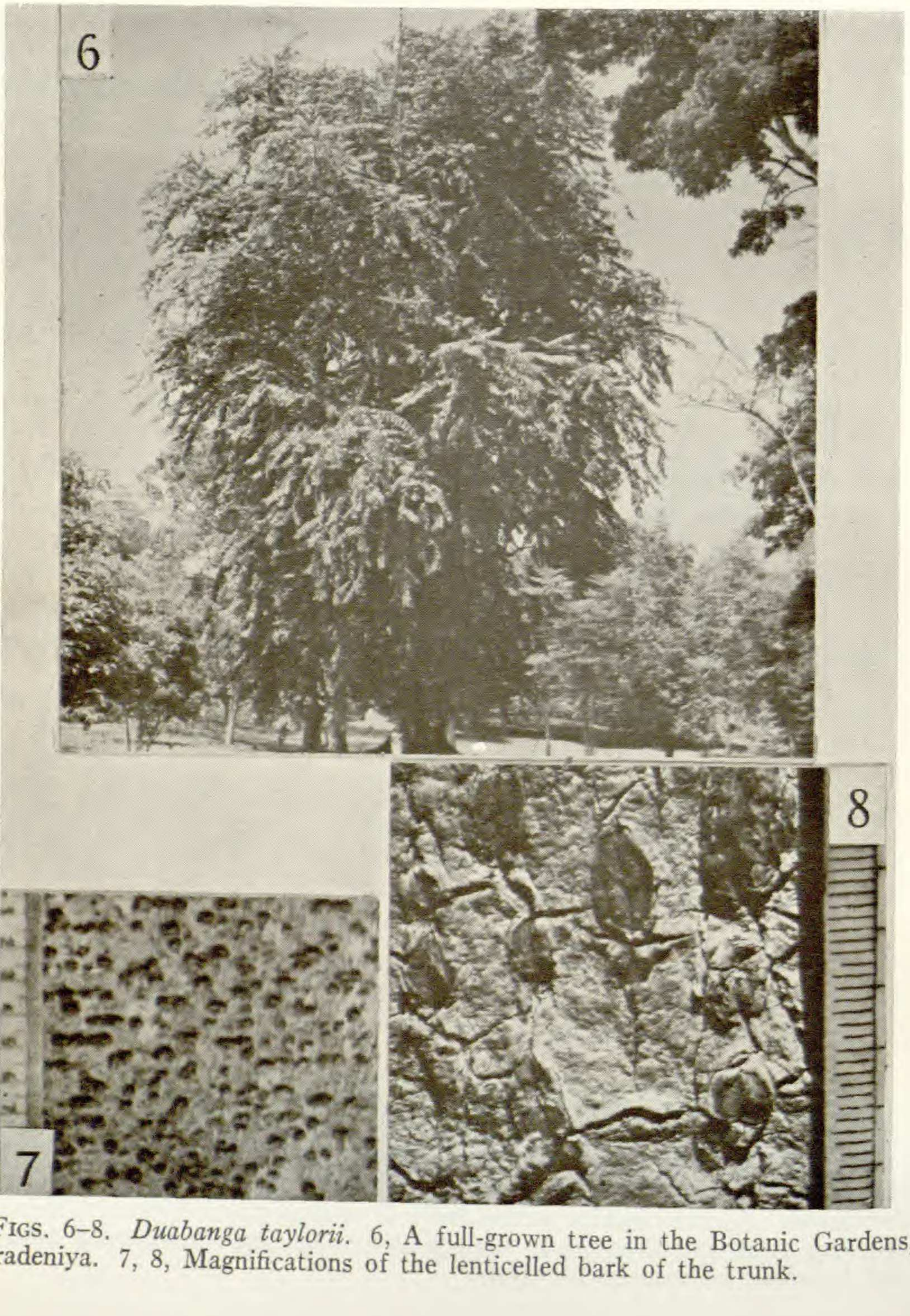


FIG. 5. *Duabanga grandiflora*, drawn from herbarium specimen *Howard & Wagenknecht 15058*, January 19, 1960; stamens and petals have fallen from the flowers. A, inflorescence and a leaf; B, reconstructed flower; C, petal; D, dehiscing fruit, lateral view; E, seed; F and G, abnormal forms with 5-merous and 4-merous perianths, respectively.

coming terete when mature; leaves opposite, large, distichously arranged, 6.5–30 cm. long, 4–11.8 cm. broad, oval, oblong, or ovate-oblong, cordate at base, lobes rounded, short-acuminate, entire, chartaceous, glabrous above, glaucous beneath, with 12–28 pairs of lateral veins, widely patent, prominent below, arcuate into an intramarginal vein, petiole short, stout, 0.4–1.2 cm. long; flowers large, regular, bisexual, perigynous 2.2–3.3 cm. across or more, many in lax, drooping, dichasial corymbs at the ends of branches, pedicels articulate, 1.5–4 cm. long; flower buds conical, 6-ridged, 1.8–2.5 cm. long, 1.8–2.2 cm. broad; sepals 6, sometimes 5 and very



FIGS. 6–8. *Duabanga taylorii*. 6, A full-grown tree in the Botanic Gardens, Peradeniya. 7, 8, Magnifications of the lenticelled bark of the trunk.

rarely 4, 1.2–2.5 cm. long, 0.8–1.3 cm. broad, ovate, acute, valvate, fused at the base with the receptacle into a wide cup-shaped calyx tube, 1.7–2 cm. across; petals 6, free, valvate, clawed, ± 4.4 cm. long, ± 2.7 cm. broad, obovate, plicate along the margin; stamens numerous, perigynous, biseriate, filaments long, filiform, 4.7–5.7 cm. long, broad at base, anthers versatile and curved; ovary half-inferior, conical, 1–1.4 cm. long, 1.2 cm. broad, 6-locular with numerous ovules on axile placentae, style 3.2–6 cm. long, stigma slightly lobed; fruit an ovoid-globose, pendulous, glabrous capsule, 3 cm. long, 3.2–3.5 cm. broad with persistent calyx segments, dehiscing loculicidally into 6–9 valves from apex downwards, seeds numerous, minute, filiform, 4 mm. long from end to end of the attenuate testa.

ILLUSTRATIONS. HOOKER f., Ill. Himal. Plants, *pl. 11.* 1855; JAYAWEERA & HOWARD, Baileya 10: *pl. 4.* 1962.

DISTRIBUTION. This species grows along banks of streams and in ravines from sea level up to 2280 m. elevation in Assam (India), Andaman Islands, Burma, Thailand, Cambodia, Malay Peninsula, Indo-China, and in Yunnan on the mainland of China. It is deciduous and flowers from January to April, bearing fruit from April to June.

India. SIKKIM: without locality, *Hook. f. & Thomson s.n.*; Darjeeling, *Kowan 24480.* ASSAM: Duars, *Biswas 1943*; Lakhimpur, *Rock 960*; S. Lushai Hills near Fort Lunglek, *Gage 72*; without locality, *King's collector 252*; Calcutta Bot. Gard., *Biswas 9400*, cultivated. **Andaman Islands.** Long Island, *Kirat Ram 3666*; S. Andamans, *Prain's collector 19.* **Burma.** CHIN HILLS: Kaupetlet, *Dickason 8616*; Rangoon, Myout Chaw, *Dickason 6942.* **Thailand.** Khwae Noi River Expedition 1946, *Bloembergen 21*; Ban Khai, *den Hode & Kostermans 473*; Doi Luang, *Rock 1802*; without locality, *Rock 665, 992*; *Mrs. Collins 953, 1141.* **Malaya.** PAHANG: Cameron's Highlands, *Henderson 23662.* **Cambodia.** Without locality, *Pierre 536.* **Indo-China.** TONGKING: Hoo Bink, *Petelot 6371.* **China.** YUNNAN: Lang-tsang Hsien, *Wang 76628*; Tsang-Yuang, *Wang 73303*; Cheli Hsien, *Wang 79292.* **U.S.A.** FLORIDA: Homestead Subtropical Exp. Station, *Howard & Wagenknecht 15058*, cultivated.

This species of *Duabanga* is distinguished from the others by its straight trunk, large 6-merous flowers, and numerous biseriate stamens.

USES. The wood is used for building purposes; it is close grained and coarsely fibrous and takes on a mottled grayish polish.

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ROYAL BOTANIC GARDENS,
PERADENIYA, CEYLON